

Customer No.: 31561  
Docket No.: 10938-US-PA  
Application No.: 10/709,005

### AMENDMENTS

#### To the specification:

Please amend the following paragraphs as follows.

[0013] With regards to the polymer substrate, it has main-chains and side-chains, which at least have an ether group, an acyl group, an amino group, a fluoro group or a Lewis base functional group. The polymer substrate can be polyalkylene oxide, polyvinyl fluoride, polyacrylonitrile, polyester, polyether, polysulfone, polyethylene oxide, polyvinylidene fluoride, poly(methyl methacrylate) (PMMA), polysiloxane, polyphosphazene or derivatives thereof. The Lewis base functional group includes oligo(oxyalkylene), fluoroalkyl group, fluoroalkylene group, carbonate group, cyano group and sulfonyl group.

[0015] The nano-tube modifier can enhance the conductivity and property of the polymer electrolyte. The surface of the nano-tube modifier has functional groups  $-OR$  and  $-O-$ , R: an alkyl group. The functional groups form Lewis acid-base interactions with the polymer substrate and the polymer salt complex. The nano-tube modifier includes  $TiO_2$ ,  $SiO_2$  or  $Al_2O_3$  with different crystal structures. The diameter (length) of the nano-tube modifier is, for example, about from 20 nm to about 160 nm. The aspect ratio (length/width) of the nano-tube modifier is more than 8. Because the total surface area of the nano-tube modifier is larger than that of nano-particle (therefore, even larger compared to a micro-sized particle) and the nano-tube modifier is hollow, the interfacial

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interaction between the tube modifier and the polymer substrates establishes strong surface charge field. This unique structure characteristic has lead to tremendous improvements in physical properties, including ion conductivity displayed in the present invention. Furthermore, the metal cations can go through or be temporarily stored therein.

[0026] The polymer substrate has, for example, main-chains and side-chains, which at least have an ether group, an acyl group, an amino group, a fluoro group or a Lewis base functional group. The polymer substrate has amorphous region between the melting point thereof and a temperature. As to the polymer substrate of the present invention, it can be polyalkylene oxide, polyvinyl fluoride, polyacrylonitrile, polyester, polyether, polysulfone, polyethylene oxide, polyvinylidene fluoride, poly(methyl methacrylate) (PMMA), polysiloxane, polyphosphazene or derivates thereof. The Lewis base functional group includes oligo(oxyalkylene), fluoralkyl group, fluoralkylene, carbonate group, cyano group or sulfonyl group

[0028] The nano-tube modifier can enhance the conductivity and property of the polymer electrolyte. The surface of the nano-tube modifier has functional groups  $-OR$  and  $-O-$ , R: an alkyl group. The functional group will form Lewis acid-base force with the polymer substrate and the polymer salt complex. The nano-tube modifier includes  $TiO_2$ ,  $SiO_2$  or  $Al_2O_3$  with different crystal structures. The diameter of the nano-tube modifier is, for

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example, about from 50 nm to about 160 nm. The aspect ratio (length/width) of the nano-tube modifier is higher than 8. Because the total surface area of the nano-tube modifier is larger than that of a nano-particle and the nano-tube modifier is hollow, the metal cations can go through or be temporarily stored therein.